RADIOACTIVE MATERIAL LICENSE (RML) NO. UT 2300249 and UT 2300478

STATEMENT OF BASIS

Low Level Radioactive Waste LLRW and 11e.(2) Byproduct Material Disposal Facility

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History of the Environmental Monitoring Plan

The following is a timeline of events that are relevant to the proposed changes to the Energy*Solutions*' Clive facility's Environmental Monitoring Plan:

- On February 2, 1988, Envirocare of Utah LLC. (Currently Energy*Solutions*) the State of Utah issued Radioactive Material License (RML) No. UT 2300249 for the disposal of low activity radioactive wastes (LLRW);
- On November 19, 1993, the Nuclear Regulatory Commission (NRC) issued Envirocare of Utah a RML (License No. SMC-1559) for the disposal of 11e.(2) byproduct material;
- August 16, 2004 the State of Utah's agreement with the NRC was amended to include 11e.(2) byproduct material thus giving the State of Utah regulatory authority over Envirocare of Utah's 11e.(2) byproduct RML;
- February 4, 2005, the Utah Division of Radiation Control (DRC) issued Envirocare of Utah a new 11e.(2) RML numbered UT 2300478 and recognized that the RML was under timely renewal;
- December 22, 2008 the Environmental Monitoring plans for the RML #UT 2300249 Application, Appendix R, and RML #UT2300478 Application Appendix LL were combined into a single Environmental Monitoring Plan;
- On June 1, 2012, Energy*Solutions* submitted revision 5 of the 11e.(2) RML renewal application;
- On March 6. 2013, Energy*Solutions* submitted revision 1 of the LLRW RML renewal application; and
- On April 9, 2014, Energy*Solutions* submitted a request to revise the Environmental Monitoring Plan and the Utah Division of Radiation Control (DRC) began negotiations on the proposed changes to the Clive Facilities Environmental Monitoring Plan.

Since both of Energy*Solutions*' RMLs are in timely renewal, the DRC concluded that the Environmental Monitoring Plan was to be reviewed separately and that review would be incorporated by reference into the final Safety Evaluation Reports for both RML renewals. The following is a list of documents associated with the proposed changes to the Clive facility's Environmental Monitoring Plan:

- Meeting briefing sheet, for meeting held on November 6, 2013 to discuss the proposed revisions to the Environmental Monitoring Plan
- Email dated December 11, 2013, sent from Bill Craig of the DRC to Vern Rogers of

Energy*Solutions*: Additional Environmental Plan Comments with Attachment

- Meeting Agenda, for meeting held March 20, 2014 to discuss proposed revisions to Environmental Monitoring Plan
- Radioactive Material License UT2300249: Environmental Monitoring Plan; Revision Request (CD14-79) dated April 9, 2014; (DRC-2014-002783)
- Email dated June 2, 2014, sent from John Hultquist of the DRC to Vern Rogers of Energy*Solutions*: Environmental Monitoring Plan-Request for Information
- Response to Requests for Information (CD14-0131), dated June 11, 2014 (DRC-2014-003922)
- Email dated July 15, 2014, sent from Vern Rogers of Energy*Solutions* to John Hultquist of the DRC: Draft EMP Response Language
- Email dated July 17, 2014, sent from Vern Rogers of Energy*Solutions* to Bill Craig of the DRC: EMP Response Language
- Final Responses to Requests for Information (CD14-0159), dated July 22, 2014 (DRC-2014-004481)

Environmental Monitoring Plan Proposed Summary of Changes

Section	Minor/Major Change	Description of Proposed Changes
1.0- Purpose and Scope	Minor	Minor edits to section.
2.0- References	Minor	References were added.
3.0- Definitions	Minor	Added the definitions for: Equilibrium Equivalent Concentration (ECC); Radon Action Level (RAL); Relative Measurement Difference (RMD); Soil Reporting Levels; and Soil Triggering Levels. Removed Radiological Release. Also made edits to existing definitions to reflect changes to the rest of the document and for consistency purposes.
4.0- Description	Minor	Minor edits to section.
4.1- Exposure Pathway: Ingestion	Minor	Minor edits to section.
4.2- Exposure Pathway: External Radiation	Minor	Minor edits to section.
4.3- Exposure Pathway: Inhalation	Minor	Minor edits to section.
4.4- Dose Limits	Minor	Section was rewritten but the rewrite does not change the information and meaning of the section.
4.4.1- UAC R313-15-101(4) ALARA Constraint	Minor	Language was added to this section to explain the rationale behind the 0.02 occupancy fraction that has been historically used in determining dose to the public.
4.4.2- UAC-R313-15-301 Public Dose	Minor	Language was added to this section to explain the rationale behind the 0.25 occupancy factor that has been historically used in determining dose to the public.

Limits During Operation		
4.4.3- UAC R313-25-19 Post Closure Public Dose Limits	Minor	Language was added to this section to explain the rationale behind the 0.02 occupancy fraction that has been historically used in determining dose to the public.
5.0- Operational Requirements	NA	No language under this heading.
5.1- Air Sampling	NA	No language under this heading.
5.1.1- Airborne Particulates-Alpha/Beta Screening	Major	Reduced the number of air particulate monitoring stations from 22 to 12. Reduced the frequency from twice-weekly to weekly of replacing sampling filters. Rewrote last paragraph to reflect changes to airborne particulate sampling.
5.1.2- Airborne Particulate-Composite Filters	Major	Reducing the frequency of analyzing the filters from quarterly to semi-annual.
5.1.3- Radon	Major	Removed monitoring for Thoron.
5.1.4- Airborne Tritium (H-3)	Major	Changed how Tritium will be monitored.
5.2- VTD Effluent	Major	Removed requirement to sample for Tritium, Iodine-129, and Krypton-85. Revised language for filter changing and reporting requirements.
5.3- Gamma Radiation	Minor	Language was added to describe what statistics will be used to evaluate data. Updated references to tables and drawings
5.4- Soil	NA	No language under this heading.
5.4.1- General	Minor	Changed language on reporting requirements to reflect the changes to soil sampling.
5.4.2- Annual Soil Samples	Major	Reduced the number of soils sampling stations. Reduced the frequency of soil sampling to annual sampling.
5.4.3- PCB Soil Samples	Major	Reduced the frequency of soil sampling to annual sampling.
5.4.4- Restricted Area Exit Gate Soil Samples	Major	Reduced the frequency of soil sampling to annual sampling.
6.0- Quality Assurance/Quality Control	Minor	An introductory paragraph was added for Section 6.0.
6.1- Analytical Laboratory Qualifications	Minor	Minor edits to paragraph.
6.2- MDC Requirements	NA	No language under this heading.
6.2.1 General	NA	No changes were made.
6.2.2 Particulate Air Sample Alpha/Beta	Minor	Minor edits to paragraph.

Screening		
6.2.3- Particulate Air Sample Semi-Annual Composite	Minor	Minor edits to paragraph to reflect the change in analyzing frequency.
6.3- Radon Detector Quality Control Requirements	Minor	Revised language to reflect changes in reporting frequency. Added language for Replicate Error Ratios (RERs) and Relative Measurement Differences (RMDs).
6.4- Gamma Detector Quality Control Requirements	Minor	Revised language to reflect changes in reporting frequency. Added language for RERs and RMDs.
6.5- Soil Sampling Quality Control Requirements	Minor	Revised language to reflect changes in reporting frequency. Added language for RERs and RMDs.
6.6- Air Sampler Flow Indicator Calibration Frequency	Minor	Minor edit to sentence. Reflecting the reduction in calibrating air sampler flow indicator from 6 months to 12 months. The change in frequency is in line with calibrating requirements found in R313-15-501(2).
7.0- Environmental Monitoring Report	Major	Decreased the reporting requirements from quarterly to semi-annually.
Table 1: Directional Radiological Summary	Minor	Changed Title and information of Table
Table 2: Radiological Program Summary	Minor	New table number.
Table 3: Active and Inactive Monitoring Locations	Minor	Changes reflect the decrease in monitoring locations.
Table 4: ECL For Selected Radionuclides	Minor	New table number.

Explanation of Major Changes

5.1.1- Airborne Particulates - Alpha/Beta Screening: Energy*Solutions* requested to reduce the frequency of changing the sampling filters at the particulate air monitoring station from twice a week to once a week. The DRC had concerns with the filters becoming loaded (i.e. too much dust on the

filter) and the air monitoring becoming less effective. However, dust loading of filters has not been a problem in the past during years of high waste volumes. The Clive procedure CL-EV-PR-013 Airborne monitoring addresses excessive loading of filter if encountered. Therefore, the DRC concurs with Energy*Solutions* to change filters once a week not to exceed nine days. The nine days would occur on weeks when no work activities are being done at the Clive site (e.g., generally a week near the July 4th and Christmas holidays). The DRC has determined that this change will not decrease Energy*Solutions* ability to demonstrate compliance because particulate air monitoring is not effected by the change in frequency.

5.1.2- Airborne Particulate- Composite Filters: Energy*Solutions* requested to reduce the frequency of changing the sampling filters at the particulate air monitoring station from twice a week to once a week. The DRC had concerns with the filters becoming loaded (i.e. too much dust on the filter) and the air monitoring becoming less effective. Energy*Solutions* committed to change filters if loading is observed. Therefore, the change was made to allow Energy*Solutions* to change filters once a week not to exceed nine days. The nine days would occur on weeks when no work activities are being done at the Clive site (see potential weeks above). The DRC has determined that this change will not decrease Energy*Solutions* ability to demonstrate compliance because particulate air monitoring is not effected by the change in frequency.

Energy*Solutions* also requested to reduce the frequency of analyzing composite particulate samples from quarterly to semi-annually. In the DRC interrogatories, the DRC asked for justification for this request. Energy*Solutions*' response states, "Since frequency of filter collection has been reduced by 50%, analysis of the periodic composite has been reduced from quarterly to semi-annually in order to represent an equivalent mass of material for the composite analysis. This is important in order to preserve the ability to trend and compare new composite data with our historic database. This change does not create any additional risk to the environment or general public" (Energy*Solutions*, 2014). The DRC concluded that since the licensee still analyses the weekly filters based on gross alpha/gross beta screening, any increase in radioactivity on the filters will be observed and the licensee can take appropriate engineering or operational controls to minimize releases that would affect the effluent concentrations released and ultimately compliance with dose limits; therefore, reducing the frequency in analyzing composite air particulate samples does not decrease Energy*Solutions* ability to demonstrate compliance.

Finally, Energy*Solutions* requested to decrease the number of air particulate air monitoring stations from 22 to 12. The DRC regulates each licensee according to the specific site conditions, applicable rules and regulations and types and quantities of regulated material at each facility. In other words, what is appropriate at one licensee's facility may not be appropriate at another licensee's facility.

Energy*Solutions* also chose to use its historic environmental data to justify the request to decrease the number of air particulate stations. To do this Energy*Solutions* made the following assumptions:

- Use a 12 point sector radial pattern centered over the foot print of the Class A West Embankment (CAW) because:
    - The 12 point sector radial pattern came from guidance document such as DOE's RESRAD modeling, EPA's AERMOD modeling, and EPA's PATHRAE modeling.
    - Centering the 12 point sector radial pattern over the CAW was due to
        - Majority of waste handling and disposal is done on the CAW;
        - Close proximity of the CAW to the restricted area boundary; and

        - Most of the bulk waste is handled in the CAW.
- Using RERs and highest average gross Alpha or Beta results to evaluate different air monitoring station located in the same sector (Energy*Solutions*, 2014).

After reviewing the information in the request to reduce particulate air monitoring stations the Director is granting the request for the following reasons:

- Energy*Solutions* is receiving less waste with the majority of it being disposed in the CAW;
- A greater percentage of waste being received is containerized waste and is not being handled as bulk waste, and if bulk waste is managed, it's managed on the CAW;
- Air particulate air monitoring stations are not being removed. They are being turned off. Therefore, if monitoring information indicates the need to turn them back on such as:
    - Bulk waste disposal increases; and/or
    - An increase of disposal activity in another part of the restricted such as the 11e.(2) embankment; and/or
    - Increasing radioactivity trends on air particulate filters at air monitoring stations.

5.1.3- Radon: Thoron is another name for Radon-220 and is part of the Thorium decay chain. It has a half-life of 56 seconds. What is commonly referred as Radon, is Radon-222 and it is part pf the Uranium decay chain. It has a half-life of 3.8 days. Because of the longer half-life Radon is considered a greater human health risk than Thoron. In addition, Radon sampling devices cannot distinguish between Radon and Thoron (NCRP, 2009). Energy*Solutions* will be reporting the gross Radon results (Radon + Thoron) instead of separating them into two different entities. The Thoron will still be accounted for in the dose calculations but it will be treated as Radon. Therefore, there is no decrease in regulatory compliance.

Energy*Solutions* also stated in their response to interrogatories, "Since NRC recognizes that because of its extremely short half-life (and comparatively short half-lives of radon-200 [thoron] daughters) when measuring outdoor gaseous radon-222 and thoron concentrations that, "thoron concentrations are especially variable. The effective surface source of [thoron] is about 0.1 km^2 which means that thoron [observed] at a given location can be assumed to have originated within that immediate area" (NRC, 2011 pg. 21). As such, it is reasonable to assume that thoron will have decayed to undetectable levels in any air sampled at locations not directly in contact with an open embankment. Air monitoring is continuously sampled at the locations listed in Table 1 and Drawing 10014-U03, as revised" (Energy*Solutions*, 2014).

5.1.4- Airborne Tritium (H-3): Tritium is a very low energy beta emitter and is very difficult to detect. Tritium is also considered very mobile in the environment (NCRP, 1976). Energy*Solutions* receives waste for disposal that contains tritium, mostly in containerized waste. The DRC has required Energy*Solutions* to sample and analyze for tritium as part of their Environmental Monitoring Plan for several years.

Since the fall of 2002 when tritium was introduced into the EMP, environmental tritium sampling results have been at least orders of magnitude below the Effluent Concentration Limit (ECL). Energy*Solutions* proposed using worker bioassay results to demonstrate compliance with public dose requirements. If worker bioassay results are non-detect for tritium then it is extremely unlikely there would be a dose to the public from tritium. However, if bioassay results detect tritium then that

information will be used to calculate the dose to the public from tritium at the restricted area boundary. This approach is very conservative. It allows Energy*Solutions* to monitor for tritium in a way that it can be detected and it provides information for determining public dose in a short period of time (e.g. days). Therefore, the DRC determined the approach to determining tritium doses to the public is appropriate and reasonable.

5.2- VTD Effluent: Energy*Solutions*' response to the interrogatories states, "Rather than specifically identifying H-3, I-129, K-85, and Kr-81, the Plan has been revised to note that VTD discharge will be sampled for airborne particulates and other gaseous constituents present in the waste being treated (since it is recognized that those radionuclides specifically called out previously are not always present in the waste being treated). This change does not create any additional risk to the environment or general public" (Energy*Solutions*, 2014). After considering Energy*Solutions*' response to the DRC interrogatory, DRC staff concluded that there is no reduction in regulatory compliance because those isotopes will be analyzed for if the waste being processed through the VTD contains them.

Revised language for changing filters was changed from "for each VTD startup" to "A new filter is used prior to each VTD startup. Filters are then changed at least once per week during the specific VTD campaign." The new language does not change the requirement. Changes to reporting VTD sampling results corresponds with the new Environmental Monitoring Reporting requirements.

5.4.2- Annual Soil Samples: Energy*Solutions* requested to decrease the frequency of soil sampling from quarterly and semi-annually to annually. In their response to interrogatories, Energy*Solutions* states that the weekly particulate air monitoring will identify an excessive radiological release. Therefore, quarterly and semi-annual soil sampling is not needed (Energy*Solutions*, 2014). In evaluating this request, the DRC had to determine the purpose for doing soil sampling at the Clive facility. The DRC concluded that soil sampling at the Clive facility is to document the change in concentration of radioactive isotopes over time around the facility. This information will be used to determine restoration activities when the Clive facility is permanently closed. This conclusion was based on:

- The remoteness of the Clive facility, which means limited impact to the public; and
- Air particulate sampling is used to determine effluent releases and ultimately dose to the public at the Clive facility.

The DRC can concur with the reduction in the frequency without having a negative impact to regulatory compliance.

Also Energy*Solutions* requested to decrease the number of soil sampling locations. Energy*Solutions* used the same methods and assumptions used to justify the decrease the number of air particulate stations. The DRCs concurrence is same as for the decrease in air particulate stations except soil monitoring locations will not be kept. If it is determined that soil sampling locations need to be increased then a new soil sampling location will be established. (See discussion under 5.1.2 Particulate Air Monitoring above).

5.4.3- PCB Soil Samples: Energy*Solutions* requested to decrease the frequency of the PCB soil sampling from twice a year to once a year. PCB sampling is not a radiological compliance issue. It is compliance issue associated with the Clive facility's RCRA Permit (EPA ID Number

UTD982598898). The Utah Division of Solid and Hazardous Waste regulates the Clive facility's RCRA Permit. Therefore, the DRC cannot grant this request and the change will not be made.

5.4.4- Restricted Area Exit Gate Soil Samples: Energy*Solutions* requested to decrease the frequency of soil sampling from quarterly to annually. In their response to interrogatories, Energy*Solutions* states that the weekly particulate air monitoring will identify effluent radiological releases. Therefore, quarterly soil sampling is not needed (Energy*Solutions*, 2014). In evaluating this request, the DRC had to determine the purpose for doing soil sampling at the Clive facility. The DRC concluded that soil sampling at the Clive facility is to document the change in concentration of radioactive isotopes over time around the facility. This information will be used to determine restoration activities when the Clive facility is permanently closed. This conclusion was based on:

- The remoteness of the Clive facility, which means limited impact to the public; and
- Air particulate sampling is used to determine dose to the public at the Clive facility.

The DRC can concur with the change in frequency of the soil sampling without having a negative impact to regulatory compliance.

7.0-Environmental Monitoring Report: Energy*Solutions* requested to reduce the frequency of reporting environmental monitoring data from quarterly to semi-annually, to correlate with the proposed change to semi-annual collection of environmental data. The DRC has to regulate each licensee according to the specific site conditions, applicable rules and regulations and type of regulated material at each facility.

The frequency of reporting environmental data does not affect compliance because most compliance limits found in the Utah Administrative Code R313-15 are annual limits. Therefore reducing the frequency of reporting does not have a negative impact on regulatory compliance and the DRC can agree to the environmental reports submitted semi-annually. Energy*Solutions* is committed to document all corrective actions due to errors and discrepancies during analysis in the semi-annual monitoring report, subject to the Quality Assurance Program.

References

Energy*Solutions* (2014), *Environmental Monitoring Plan Interrogatory Responses (received April 9, 2014 and June 2, 2014)*, Salt Lake City, Utah.

National Council on Radiation Protection and Measurements (NCRP) (2009), *Ionizing Radiation Exposure of the Population of the United States, NCRP Report No. 160*, Bethesda, Maryland.

National Council on Radiation Protection and Measurements (NCRP) (1976), *Tritium Measurement Techniques*, NCRP Report No. 47, Washington D.C.

Nuclear Regulatory Commission, (NRC) (2011), ADAMS document: ML11227A237; page 21 (http://pbadupws.nrc.gov/docs/ML1122/ML11227A237.pdf)